

## **Preamble for a TFI-OFDM Communications System**

**[0001]** This application claims the benefit of U.S. Provisional Applications: No. 60/453,875, filed 03/11/2003, entitled "Hierarchical Preamble for a TFI-OFDM System;" No. 60/477,186, filed 06/10/2003, entitled "Use of Different Hierarchical Preambles to Distinguish Between Multiple Piconets;" and No. 60/502,414, filed 09/12/2003, entitled "Four Hierarchical Preambles to Distinguish Between Multiple Piconets" which applications are hereby incorporated herein by reference.

### **CROSS-REFERENCE TO RELATED APPLICATIONS**

**[0002]** This application is related to the following co-pending and commonly assigned patent applications: Serial Number 10/688,169, filed 10/18/2003, entitled "Time-Frequency Interleaved Orthogonal Frequency Division Multiplexing Ultra Wide Band Physical Layer," which application is incorporated by reference; patent application entitled "Multi-Channel Option for TFI-OFDM", Attorney Docket Number TI-36381, <sup>US Application No. 10/844,832</sup> patent application entitled "Low Data Rate/Low Power TFI-OFDM UWB Devices," <sup>US Application No. 10/858,273</sup> Attorney Docket Number TI-36543.

### **TECHNICAL FIELD**

**[0003]** The present invention relates generally to a system and method for digital communications, and more particularly to a system and method for simplifying preamble detection and reducing power consumption in receivers.

### **BACKGROUND**

**[0004]** In a typical wireless communications system, in order to reduce power consumption, a receiver periodically wakes up from a sleep state to determine if there is a transmission for

present invention. In a communications system that is using TFI, a transmit pattern may be used to specify the frequency channels used, for example, a transmit pattern of [1 1 2 2 3 3] implies that frequency channel #1 is to be used to transmit the first two periods and then frequency channel #2 is used for the next two periods and frequency channel #3 is used for the fifth and sixth periods, with the pattern repeating. The term interleaving sequence may sometimes be used interchangeably with transmit pattern. Note that many different transmit patterns may be possible. Refer to a co-pending and co-assigned patent application entitled "Interleaving Sequences for Multiple Access," US Application no. 10/844,832, Attorney Docket Number TI-36381, for a detailed discussion of different interleaving patterns.

[0038] In order to support boundary detection (for example, between the packet synchronization sequence 205 (Figure 2a) and the frame synchronization sequence 210 (Figure 2a)), the final periods of a packet synchronization sequence should be followed by the first periods of a frame synchronization sequence, with both periods appearing upon the same frequency channel. With the standard PLCP preamble 105 (as shown in Figure 2a) and certain transmit patterns, such as [1 1 2 2 3 3], the periods of the frame synchronization sequence 215 do not appear in all three frequency channels. With the transmit pattern [1 2 1 2 3 3], the periods of the frame synchronization sequence 215 are transmitted on frequency channels 1 and 3, with two periods transmitted on frequency channel 3. One way to ensure that this occurs is to interleave the packet synchronization sequence 205 with the frame synchronization sequence 210. Rather than having disjoint packet and frame synchronization sequences as displayed in Figure 2a, the PLCP preamble 105 displayed in Figure 2b has an interleaved packet and frame synchronization sequence 255. Since the packet synchronization sequence may be significantly longer than the frame synchronization sequence, the frame synchronization sequence periods may be interleaved